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rayi murrayi, M. murrayi typica, and *M. murrayi timorensis,* the *typica* not representing the typical form at all. *Metacrinus murrayi* (to speak with nomenclatorial accuracy), previously known from the Ki Islands and Arafura Sea, was again found at the Ki Islands, and also at Timor.

Perhaps it is wisest to do as Dr. Döderlein has done and recognize by name the various geographical variations of the Metacrinus species, but it certainly conjures up a terrible vista of possibilities, for it is difficult to imagine more variable organisms than the species of this genus, according to my experience. I have examined some additional varieties of *M. superbus* from Japan, and a bewildering, though small, series of *M. angulatus* from the same locality, some of which fall into the group with "five radials," and others into that with eight to twelve, while *M. rotundus,* also falling into both groups, is even more variable; and it seems to me that if we once get a good start on the trinomial system in any branch of the recent crinoidea, with the continuance of the present activity in the field, it will not be long before each genus will require a specialist for its elucidation.

Dr. Döderlein is to be congratulated on the results of his study of the *Siboga* collection, and the production of a volume which will long stand as the authoritative work on the stalked crinoids of the East Indian seas, and which not only treats of the stalked crinoids systematically as a class, but suggests many interesting new lines of investigation, and bears throughout the stamp of one who not only has an exhaustive knowledge of the group under consideration, but of many different forms of animal life as well.

AUSTIN HOBART CLARK.

U. S. BUREAU OF FISHERIES.[2]

ANIMAL PATHOLOGY

Trypanosome Diseases.—Recent investigations which have been carried out in foreign laboratories with the object of ascertaining the mode of cure for sleeping sickness, and other trypanosome diseases have resulted in demonstrating certain features in the biological conduct of these protozoa towards chemical stimuli which are of extreme interest. Thus far only three groups of chemicals have been discovered which are efficient in the treatment of trypanosome infections. They are: (*a*) benzidin dyes, (*b*) basic triphenyl-methane dyes and (*c*) arsenical compounds. In experimental animals complete cure has apparently been effected by maximum doses of these compounds. With lesser doses and prolonged treatment the parasites may disappear from the blood for a time, but later on make their appearance again. Those which recur have undergone a pronounced change in their biological characters and constitute a strain resistant to the therapeutic agent employed. Such a strain manifests chemo-resistance of a specific character towards the particular substance used to develop it and an increased resistance towards other compounds of the same group. On the other hand, the development of resistance towards one group causes no increase whatever in the resistance towards other groups. By continued experiments, however, a strain has been produced manifesting a triple resistance, specific towards each of substances employed.

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[2] Published with the permission of the Commissioner of Fish and Fisheries.

Chemo-resistance, once acquired, persists unchanged while the resistant trypanosomes are passed through normal animals even for one hundred and forty transfers extending over fourteen months. This has been cited as strong evidence of the transmission of acquired characters. The specificity of the resistance is very striking. After an experimental animal has been inoculated with a mixture of two resistant strains and is then treated with a substance towards which one of the elements is resistant, the other element will disappear from the blood, but the resistant strain will remain and develop unchecked. Indeed, the two strains remain separate and capable of isolation after repeated passages through infected animals. Or, in other words, a strain with double resistance or with modified resistance does not arise as the result of infection with a mixture of two resistant strains.

HENRY B. WARD.

ANIMAL BEHAVIOR

Recent Work on the Behavior of Higher Animals.—There exist to-day two main centers for the strictly scientific and experimental study of the behavior of the higher animals. One is at Harvard, led by Yerkes, the other at Chicago, under Watson. Excellent work appears at times from other quarters, but it can usually be traced to the influence of one of the two men named. There is a third independent center for such work at Clark